

EXHIBIT 2

The Future of TV

Coming soon to the small screen: technology that will enable you to watch anything you want, anytime, anywhere. All that's needed is a magic box.

by Mark Fischetti

Nov 1, 2001

It's 8:30 in the evening. You sit on your couch, grab the remote control and click through your 42 cable TV channels. Same old stuff. So you suffer through the slowly scrolling program guide. Finally, you find a good movie—but it doesn't start till 10:00 p.m. Darn.



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It's then that you realize you could be watching that big soccer match in Rio de Janeiro, but your cable company isn't carrying it. A Richard Pryor movie would brighten your outlook, but you'd have to rent a video. One of those amateur Internet movies might be interesting, but that means sitting in your stiff desk chair staring at a small screen—and, oh yeah, the movie will take an hour to download. You smirk. After a half-century of television, you're still hostage to a few tired broadcasters.

Stay tuned. Much of the broadcast, reception and display technology needed to let you see whatever show you want, whenever you want, on whatever screen you want, exists. The pieces just have to be improved and linked together in the right way.

Connecting the chain will be no small feat. But it will be forced by a much larger convergence already under way in digital entertainment. As digital movies and television programs become increasingly common, they are morphing with video games, Internet video and music into one uniform stream of digital content. At the same time, the distribution channels for that content—cable TV, satellite and the Internet—are widening into one big broadband pipe to your home.

What's missing is a commercial platform—a box in your home containing electronics and software that will let you receive the digital entertainment, interact with it and display it on any screen. Your TV, even a digital one, isn't powerful enough, and neither are the set-top converter boxes that receive signals from cable or satellite providers. The need for a radically new platform "has created a massive opportunity for technology companies to innovate," says Banc of America Securities analyst William Bao Bean, who specializes in digital entertainment. A new industry composed of startups and veteran electronics firms is emerging to supply that platform, which could be an advanced set-top converter, a personal video recorder or a souped-up version of a game machine.

And what of the television set? Once the magic box arrives, we will no longer need it.

The Test

The technology push applied by this convergence nicely matches the pull consumers are exerting. In decades past we spent our electronic-entertainment budgets on TV sets and got programming free over the airwaves. A "better" viewing experience meant buying a color TV, then one with a bigger screen. By the late 1980s, "better" meant "more," and we bought subscriptions to cable or satellite television.

Today, we receive more channels than we can attend to. And we must wait for the few gems we care to view. What we really crave is "custom TV," which would offer all the digital entertainment we wanted, whenever we wanted it. "We are moving from a subscription model to a usage model," Bean says.

Marketers are continually telling us that if we spend enough money, we can have the future of TV now. But will the next big thing really pass the test of moving us closer to custom TV? Or will it just give us a nicer picture?

Go to your local electronics store and you'll probably hear the same pitch I heard from Mitch, an overly exuberant sales guy. "This is the future of TV right here," Mitch bubbles, pointing at a big-screen Philips Magnavox. "It's home theater, really. And check out these babies: projection TVs. They're really big. Or," he turns in awe toward the private viewing room, "you can go for a flat, plasma display. The picture is really sharp. It'll set you back \$8,000, but man, it's worth it."

Do these contradictions get us the shows we want, when we want them? They

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but it's not a well-made and classless image. It's a fake new entertainment experience, not just a fancier image. Test failed.

Undaunted, the salesman swoons over the new "digital TVs," one of which can display that big innovation we've heard about for a decade: high-definition television. But just try to find a digital broadcast. In 1996 the Federal Communications Commission passed a regulation requiring U.S. broadcasters to stop all analog broadcasts by 2006. To date, only a few networks, such as HBO and ABC, are sending digital signals; the rest are in no hurry to start. Still failing.

Okay, so Mitch can't sell me the future of digital entertainment. How about my local cable TV distributor? Maybe it can send me some of that "interactive TV" programming (sometimes referred to as "enhanced TV") I've been hearing about. Whoops: I have to set up my personal computer in the same room as my TV in order to play along with game shows like *Who Wants to Be a Millionaire*? And this ad hoc setup still won't support the real promise of interactive TV, such as clicking on baseball's highest-paid player, Alex Rodriguez, to see his stats when he comes to bat. Or ordering products that appear on a show's set. Or—ultimately—finding only what I want and viewing it right then. The so-called Digital Television Application Software Environment standards needed for such interactions won't be finalized until late this year, and televisions based on them probably won't be available until 2003, according to Lynn Claudy, senior vice president for science and technology at the National Association of Broadcasters. And then, says Claudy, who participates in the international Advanced Television Systems Committee responsible for setting these standards, "the broadcast will have to be digital, and so will your TV." It's 2006 again.

Creating the Magic Box

Even if you had a digital TV and received an interactive digital broadcast, you would still be limited to programming from your local airwaves broadcasters or cable or satellite TV distributor. Gaining access to all entertainment all of the time requires technology that would let you find specific movies, TV shows and Internet videos, download and store them on a hard drive, and play them whenever you wanted—on any display screen, not just a digital TV.

The race to provide such a component began in 1999, when startup companies TiVo of San Jose, CA, and ReplayTV of Mountain View, CA, introduced the first prototypes, dubbed personal video recorders or digital video recorders. Essentially, they operate like set-top boxes with fat hard drives. The signal from your cable or satellite television distributor passes through the machine's memory en route to your TV. The box records and plays back the signal at the same time. That allows you to pause an episode of *The West Wing*, run to the bathroom for two minutes, then pick up exactly where you left off, the machine playing it from storage as it continues to record the ongoing broadcast. You see the whole show but end at 10:02 instead of 10:00. Or you can fast-forward and catch up. You can even freeze live action to marvel at Martin Sheen's furrowed brow. The early boxes cost \$400 to \$700, plus a monthly subscription fee of \$10 to \$20 (or \$200 lifetime).

The bigger possibility was that, eventually, you could bypass your local cable company completely. You could tell your digital video recorder to search a large electronic program guide maintained by TiVo or Replay and then download all sorts of shows from all sorts of broadcasters. You could select a 1956 variety show, all of Julia Roberts's movies or the first eight episodes of Star Trek. In short, you could have custom TV. Worried, most of Hollywood's major studios, and most of the major cable and satellite TV providers, invested in or partnered with TiVo or Replay, so they wouldn't be shut out if such a service began.

Neither company has fulfilled the grand vision, however. In November 2000 ReplayTV announced it would stop making boxes; digital-media company Sonicblue soon purchased ReplayTV and is integrating its technology into future products. TiVo continues, but with limited service and software. Its box can connect to the Internet, but it uses a narrowband modem, so it cannot support interactive viewing. More importantly, the central store of "all" television shows and movies has not materialized. Subscribers can only get TV shows offered by their cable or satellite providers. And they still must wait until a show is aired to record it. TiVo has not been able to convince media companies to make their content available directly through a TiVo program guide in part because its software cannot prevent consumers from making and swapping unauthorized copies, or stop hackers from stealing the signal. "It is very easy to copy a digital signal and rebroadcast it with no loss," says Carl McGrath, vice president of Motorola's DigiCable division. "The content industry is scared to death, and they should be." So are the distributors.

Seeing the potential to sell a new type of box and attract monthly TV subscribers, Microsoft entered the fray in March 2001, when its competing digital video recorder and service, called UltimateTV, hit retail shelves. It gives consumers DirecTV's satellite programs but feeds them through a video recorder box. The package also includes Microsoft's WebTV software, which lets you connect to the Internet through a phone line and display Web pages and e-mail on your TV. But like TiVo, UltimateTV is too slow to download Internet video. It cannot provide piracy- or copy-protection either.

Motorola is also taking aim at the magic box. It makes more than two-thirds of set-top cable boxes. New boxes in its DCT5000 series, for sale this year, will have more computing power than a digital video recorder and include a broadband cable modem. "It really is a video workstation," says McGrath. The successor device now being developed will have a hard drive for storing

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and replaying video, turning the set-top box into a broadband digital video recorder.

Nonetheless, Motorola must clear the same copy protection hurdles as Microsoft and TiVo before it can offer custom TV. Protection schemes will likely be part of a box's underlying operating system, which puts the onus squarely on companies like Liberate Technologies and OpenTV that supply platform software to hardware makers like Motorola. The specter of Microsoft dominating this critical arena with its own proprietary operating-system standard—just as it has PCs—seems to have galvanized action. In June, just three months after Microsoft's UltimateTV hit the market, two dozen companies, including Motorola, TiVo, OpenTV and Liberate Technologies, announced they had formed an alliance based on the open-source operating system Linux. This TV Linux Alliance aims to establish specifications for interoperability that would let consumers buy whichever television, set-top box or digital video recorder they wanted, and subscribe to whichever television distribution service they wanted—and be sure everything would work together. Linux would thus become the operating system for all platforms—UltimateTV excepted. Only Microsoft has the power and cash to fund deployment of an operating system by itself, says Bryan Sparks, CEO of Lineo, one of the platform firms involved in the alliance. "The alliance makes sure the rest of us don't miss an opportunity to compete with them."

Although digital video recorders and set-top boxes are the front-runners, a third contender threatens: the video game system. Sony's PlayStation 2, for example, already has a microprocessor that surpasses those in digital video recorders, plus a video processor robust enough to control a TV set—and it recently added Internet access and online gaming options. This month, Nintendo was to release a similarly powerful machine called the Gamecube, and Microsoft was to begin selling the Xbox in the United States. All three devices lack tuner cards to receive TV signals and hard drives to store and replay shows. But these capabilities could be added, and as broadband expands, online gaming could begin to erase the difference between games and TV shows. Robert Bach, chief Xbox officer at Microsoft, says the company already envisions "episodic content," where new scenarios, characters and storylines are injected as online games proceed. "It is much more like producing a show than creating a game."

Microsoft has ubiquitous software and two hardware choices: UltimateTV and the Xbox. But the regime has little content, and it falls short in distribution. It's no secret, however, that Bill Gates has a keen interest in building a low-earth-orbit satellite network. And Murdoch has courted Gates as a potential bidding partner for DirecTV. If Murdoch and Gates worked together, both companies could complete the digital-entertainment chain. News Corporation and Microsoft both declined to discuss strategy for this story.

That brings us to Sony. It has plenty of content (Sony Pictures, Sony Music), and plenty of hardware and software. Sony's platform strategy is clear: turn the PlayStation 2 and its successor, PlayStation 3, into the magic box. It's got distribution too. In late May Ken Kutaragi, CEO of Sony Computer Entertainment, announced that Sony Entertainment had formed a strategic alliance with none other than AOL Time Warner. Sony gets distribution and AOL Time Warner gets a box. Sony also announced that networking giant Cisco Systems would develop software to give PlayStations broadband Internet access. Other plans include technology to let Sony video camera users upload their movie creations through the company's Vaio laptop computer or PlayStation 3 onto its So-Net Internet portal, where any subscriber could retrieve and watch them. "You could even broadcast your own show live," says Masaaki Oka, a producer in Sony's creative-development department, "or create your own online video game."

Sony bills such moves as creating a new world of broadband entertainment "through the fusion of games, music, movies, and broadcasting." But critics question whether any one company could corner the digital-entertainment industry. "It's logical for [Sony] to try," says Claudy, the National Association of Broadcasters' technology guru. "But they have different core competencies and may not be good at providing the missing links."

The most likely outcome, he and other experts say, is a few giant companies that compete by offering custom TV services. Which package consumers choose will depend largely on price. "The cable and satellite companies are not sure how much consumers might pay," Claudy agrees. "Eventually, the enigmatic desires of consumers will become clear. That will drive up volume, which will drive down cost."

The Last 12 feet

Once companies integrate digital content and distribution with a platform, we might finally have custom access to all TV shows, movies, music and online gaming for a low price. But it may not stop there. Since a magic box will accept broadband, it could become the lauded gateway to the home for everything digital, including Internet and telephone. And because it will have an operating system that can control peripherals, it could function as the home's central controller, directing the security system, appliances, heating, desktop computers and all sorts of wireless devices.

One of the first real-world trials of such a system began in August, in Ajax and Pickering, Ontario, just east of Toronto. Rogers Cable, the local cable provider, installed small silver-and-black boxes in 50 subscribers' homes. A Linux-based networking platform made by Ucentric Systems of Maynard, MA, connects each home's computers and appliances to each other and the Internet. The system can provide television, Internet and telephone services on all TVs, plus voice mail and e-mail on all telephones and computers. The

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U-verse TV unit does not yet have digital-video-recorder capabilities or its own electronic programming guide, so you can't receive digital-TV signals--so custom TV remains out.

It's not the magic box, but it's an indication that the technology is within reach. That's why, says Bean, "the battle in broadband distribution is no longer the last mile' to the home, it's the last 12 feet' inside that home"--delivering not just bandwidth capacity but a custom broadband experience people can enjoy from a comfortable seat in any room.

The day that arrives, you'll go to the electronics store and buy a "home gateway" box the size of today's VCR for maybe \$300. You'll hook it to a broadband cable, then connect it to your wired or wireless home network. You'll call the cable provider and sign up for its custom-TV digital recording service for maybe \$50 a month. You'll hang a flat plasma display (prices will have dropped since Mitch's day) on the living-room wall and connect it to a wall socket that also taps into the home grid. You'll put modest displays in other rooms, too. As you leave the bedroom you'll say "off" to its screen, and as you enter the kitchen you'll say, "Screen, show me my stock numbers." During a commercial you'll use a little wireless remote to instruct the hidden gateway box to find, download and play an original Star Trek episode. When the episode ends you'll grab the game controller off the coffee table, become Captain Kirk on the plasma screen and engage in a live, online dogfight in the Neutral Zone with an opponent from Tokyo.

And you'll wonder: will anyone buy that old "TV" stashed with the other junk for your tag sale Saturday? Hmm. Maybe some collector of obsolete technology. 

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